



Spring 2001 Released Test

(Supplemental Information)

End of Course

Algebra I

Property of the Virginia Department of Education

© 2001 by the Commonwealth of Virginia Department of Education, James Monroe Building, 101 N. 14th Street, Richmond, Virginia, 23219. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Commonwealth of Virginia public school educators may photocopy or print any portion of these Released Tests for educational purposes without requesting permission. All others should direct their requests to the Commonwealth of Virginia Department of Education at (804) 225-2102, Division of Assessment and Reporting.

Introducing the Virginia Standards of Learning

Algebra I

The complete set of items that appeared on the Spring 2001 Standards of Learning test taken by most public school students in Virginia is presented in the following pages. The intent of this release of these test questions is to provide parents and teachers additional information to accompany the Student Performance Report and/or the Parent Report.

The information accompanying each test question is broken into several components:

Reporting Category: Matches the score report and allows for identification of strengths and weaknesses indicated by student scores.

Standard of Learning: Presents the SOL used in developing the assessment question.

Instruction: Provides information for teachers to use as the SOL is incorporated into instruction.

The answer to each question can be found at the back of the booklet.

Algebra I

End of Course

Reporting Category: Expressions and Operations

A. Standard of Learning: A.2 The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables. Students will choose an appropriate computational technique, such as mental mathematics, calculator, or paper and pencil.

Builds On: Work with variables and representation of verbal expressions begins with the mathematics SOL in fifth grade and continues through the sixth, seventh, and eighth grade SOL. The study of Order of Operations occurs in the seventh and eighth grade SOL.

A

- 1 Victor bought a computer for \$1,800. He made a down payment of \$200 and will pay the rest in 5 equal payments. If p represents the amount of each payment, which equation can be used to find this amount?

A $\$200p = \$1,800$
 B $\$1,800 + 5p = \200
 C $\$1,800 + \$200 = 5p$
 D $\$1,800 = 5p + \200

- 2 What is the value of $x(5 + y)$ if $x = 4$ and $y = 2$?

F 18
 G 22
 H 28
 J 36

Instruction: Provide students opportunities to evaluate expressions for a given replacement set.

B. Standard of Learning: A.10 The student will apply the laws of exponents to perform operations on expressions with integral exponents, using scientific notation when appropriate.

Builds On: Work with exponents begins in the mathematics SOL in fifth grade and continues to be studied through the sixth, seventh, and eighth grade SOL. Scientific notation and computation with integers is found in the seventh and eighth grade SOL.

B

- 3 The population of Asia is about 3.4×10^9 . The population of Africa is about 7×10^8 . About how many more people live in Asia than live in Africa?

A 27,000,000
 B 270,000,000
 C 360,000,000
 D 2,700,000,000

- 4 Which is equivalent to $\frac{b^6}{b^2}$?

F $\frac{1}{b^3}$
 G b^3
 H b^4
 J b^8

Instruction: Provide students an opportunity to perform operations on expressions using the laws of exponents. Problems with scientific notation are seen as an application of these laws.

Algebra I

End of Course

A. Standard of Learning: A.11 The student will add, subtract, and multiply polynomials and divide polynomials with monomial divisors, using concrete objects, pictorial representations, and algebraic manipulations.

Builds On: Work with the Order of Operations and computation with integers occurs in the mathematics SOL in grades 7 and 8.

A

- 5 Which is equivalent to $(5x^2 + 4x + 1) + (-7x + 2)$?

A $-2x^2 + 6x + 1$
 B $5x^2 - 3x - 1$
 C $5x^2 - 3x + 3$
 D $5x^2 + 11x + 3$

- 7 Ben's Bakery charges a fee of $2d + 25$ to deliver d boxes of baked goods while Dan's Bakery charges $3d + 20$. Which expression describes how much more Dan's Bakery charges than Ben's Bakery?

A $5d + 45$
 B $d - 5$
 C $d + 5$
 D $-d + 5$

- 6 Which expression is equivalent to

$$\frac{8x^4 - 2x^2}{2x^2}?$$

F $4x^2$
 G $6x^2$
 H $4x^2 - 1$
 J $6x^2 - 1$

Instruction: Provide students an opportunity to experience the various representations of polynomials and work with polynomials presented in contextual situations as well.

Algebra I

End of Course

A. Standard of Learning: A.12 The student will factor completely first- and second-degree binomials and trinomials in one or two variables. The graphing calculator will be used as both a primary tool for factoring and for confirming an algebraic factorization.

Builds On: Work with developing number sense and the understanding of mathematical facts necessary to be successful with factoring occurs throughout the K-8 mathematics SOL.

A

8 When completely factored, $x^2 + x - 12$ equals —

- F** $(x + 3)(x - 4)$
- G** $(x + 4)(x - 3)$
- H** $(x + 7)(x - 5)$
- J** $(x + 12)(x - 1)$

10 When completely factored, $3x^2 - 48$ equals —

- F** $3(x^2 - 48)$
- G** $3(x^2 + 16)$
- H** $3(x - 4)(x + 4)$
- J** $(3x - 16)(x + 3)$

9 One factor of $5x^2 + 13x - 6$ is —

- A** $5x - 6$
- B** $5x - 1$
- C** $5x - 2$
- D** $5x - 3$

Instruction: Provide students an opportunity to factor second-degree polynomials with integral coefficients and a positive leading coefficient less than four.

Algebra I

End of Course

A. Standard of Learning: A.13 The student will estimate square roots to the nearest tenth and use a calculator to compute decimal approximations of radicals.

Builds On: Work with square root begins with the mathematics SOL in grade 6 and increases in complexity through grade 8.

A

11 Which is closest to the value of $3\sqrt{5}$?

- A 3.9
- B 6.7
- C 7.5
- D 8.7

12 Which is closest to the value of $\sqrt{12} \cdot \sqrt{15}$?

- F 52.0
- G 13.5
- H 13.4
- J 6.7

Instruction: Provide students with opportunities to use the calculator to find square roots and make reasonable interpretations of the displayed values for a given situation.

Algebra I

End of Course

Reporting Category: Relations and Functions

A. Standard of Learning: A.5 The student will analyze a given set of data for the existence of a pattern, represent the pattern algebraically and graphically, if possible, and determine if the relation is a function.

Builds On: Work with patterns begins with the mathematics SOL in Kindergarten and progresses in difficulty through grade 8. Emphasis on a graphic interpretation of patterns occurs in the sixth, seventh, and eighth grade SOL.

A

- 13 The table shows the relationship between the cost, c , in dollars of a taxi ride and the number, t , of minutes the ride lasts.

t	5	10	15	20
c	4.75	6.5	8.25	10

Which equation algebraically represents this data?

- A $c = 3 + 0.35t$
 B $c = 2.75 + 0.5t$
 C $c = t - 0.25$
 D $c = 4 + 0.15t$

- 14 In which table are all the points represented by the equation

$$y = -\frac{x}{4} + 2?$$

F

x	0	2	6	8
y	2	1	$\frac{1}{2}$	0

G

x	0	4	6	8
y	2	1	$\frac{1}{2}$	0

H

x	0	4	6	8
y	2	1	0	-1

J

x	0	2	4	6
y	2	1	0	$-\frac{1}{2}$

- 15 Which of the following tables does *not* represent a function?

A

x	$f(x)$
2	7
3	10
5	16
8	25

B

x	$f(x)$
1	2
7	2
-4	2
-5	2

C

x	$f(x)$
36	6
36	-6
25	5
25	-5

D

x	$f(x)$
0	36
2	38
9	45
20	56

16

x	y
0	4
3	1
6	-2

Which equation *most* likely describes the relation indicated by the table?

- F $y = x + 4$
 G $y = x - 2$
 H $y = -x + 4$
 J $y = -x - 8$

Instruction: Provide students with opportunities to analyze a table of ordered pairs and sets of ordered pairs to identify a pattern; and to determine if a relation is a function from a set of ordered pairs.

Algebra I

End of Course

A. Standard of Learning: A.15 The student will determine the domain and range of a relation given a graph or a set of ordered pairs and will identify the relations that are functions.

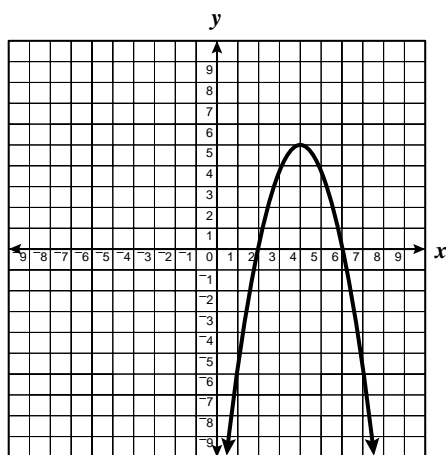
Builds On: Work with the terms of domain and range begins with the seventh grade mathematics SOL and continues in the eighth grade SOL when work with relations begins.

A

- 17 Which of the following sets of ordered pairs is a function?

- A $\{(2, 1), (2, 2), (3, 4), (5, 6)\}$
- B $\{(-2, -1), (1, 2), (3, 4), (1, 5)\}$
- C $\{(1, 2), (2, 2), (3, 3), (2, 4)\}$
- D $\{(1, 1), (2, 1), (3, 2), (4, 4)\}$

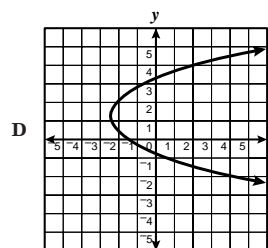
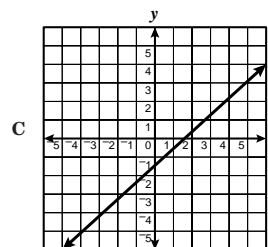
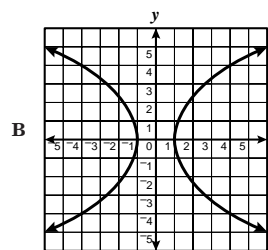
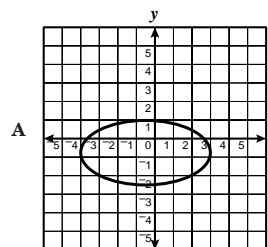
- 18 The graph shows part of a function f .



What is the range of the function?

- F All real numbers
- G All real numbers less than or equal to five
- H All real numbers greater than zero
- J All real numbers between 2 and 6

- 19 Which of the following represents the graph of a function?



Instruction: Provide students an opportunity to determine the domain and range of a function for a given set of ordered pairs or from a graph, and to determine from a graph if a relation is a function.

Algebra I

End of Course

A. Standard of Learning: A.16 The student will, given a rule, find the values of a function for elements in its domain and locate the zeros of the function both algebraically and with a graphing calculator. The value of $f(x)$ will be related to the ordinate on the graph.

Builds On: Work with the terms of domain and range begins with the seventh grade mathematics SOL and continues in the eighth grade SOL when work with relations begins.

A

- 20 What is the range of the function

$f(x) = \frac{1}{2}x + 5$ when the domain is $\{2, 4, 6\}$?

F $\{-6, -2, 2\}$

G $\{6, 7, 8\}$

H $\{2, 4, 6\}$

J $\{1, 3, 5\}$

- 22 Which is a zero of the function

$f(x) = x^2 + 3x - 4$?

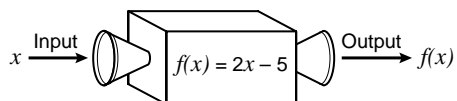
F -4

G -1

H 3

J 4

21



Using the function machine from the diagram, what is $f(10)$?

A 5

B 7.5

C 15

D 25

Instruction: Provide students with an opportunity to calculate the functional values (range) for a given function, in a variety of contexts, when provided values for the domain.

Algebra I

End of Course

A. Standard of Learning: A.19 The student will analyze a relation to determine whether a direct or inverse variation exists and represent it algebraically and graphically, if possible.

Builds On: Work with relations begins with the mathematics SOL in grade 8.

A

23 Which equation represents an inverse variation?

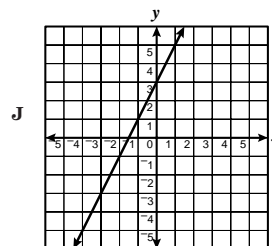
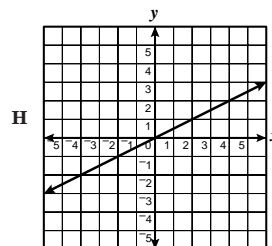
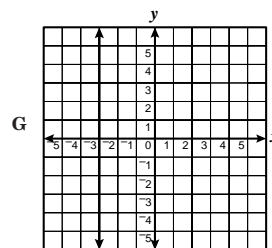
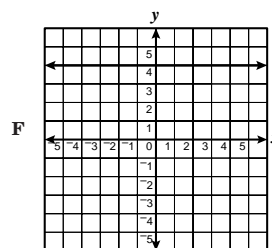
A $\frac{a}{4} = \frac{b}{9}$

B $\frac{a}{5} = \frac{2}{b}$

C $2a + 3 = 4b + 3$

D $\frac{a}{b} = 7$

24 In which graph is y a direct variation of x ?



Instruction: Provide students with an opportunity to write an equation for an inverse variation based on a set of data and to determine the constant of variation based on a set of data; and to interpret a graph to determine which of the displayed functions is a direct variation.

Algebra I

End of Course

Reporting Category: Equations and Inequalities

A. Standard of Learning: A.1 The student will solve linear equations and inequalities in one variable, solve literal equations (formulas) for a given variable and apply these skills to solve practical problems. Graphing calculators will be used to confirm algebraic solutions.

Builds On: Work with equations begins in the mathematics SOL for grade 2 when students complete numerical sentences involving basic facts for addition and subtraction and becomes more formal in the sixth, seventh, and eighth grade SOL.

A

- 25 Pauline sells cookie baskets. She charges \$5 for the basket plus \$2 per cookie. If one filled basket sells for \$31, how many cookies are in it?

A 13
B 15
C 18
D 20

- 26 What is the solution to $3(x - 5) \geq 12$?

F $x \leq 1$

G $x \geq -1$

H $x \geq \frac{17}{3}$

J $x \geq 9$

- 27 Mary published her first book. She was given \$10,000.00 and an additional \$0.10 for each copy of the book that sold. Her earnings, d , in dollars, from the publication of her book are given by

$$d = 10,000 + 0.1n$$

where n is the number of copies sold. During the first year Mary earned \$35,000.00 from the publication and sale of her book. How many copies of her book sold in the first year?

A 25,000
B 35,000
C 250,000
D 350,000

Instruction: Provide students an opportunity to solve multi-step inequalities in one variable; to solve a literal equation (formula) for a specified variable; and to apply skills for solving linear equations to practical situations.

Algebra I

End
of
Course

A. Standard of Learning: A.3 The student will justify steps used in simplifying expressions and solving equations and inequalities. Justifications will include the use of concrete objects, pictorial representations, and the properties of real numbers.

Builds On: Work with the properties of real numbers begins with the mathematics SOL in grade 7.

A

28 Which is an example of the commutative property of addition?

F $3 + 5m = 3 + (1 + 4)m$

G $3 + 5m = 5m + 3$

H $3 + 5m = (3 + 5)m$

J $3 + 5m = 3m + 5$

29 What property of real numbers justifies the following statement?

$4x(y + 2) - 3y$ is equivalent to $4x(y) + 4x(2) - 3y$

- A** The associative property of multiplication
- B** The commutative property of multiplication
- C** The distributive property of multiplication over addition
- D** The closure property of multiplication

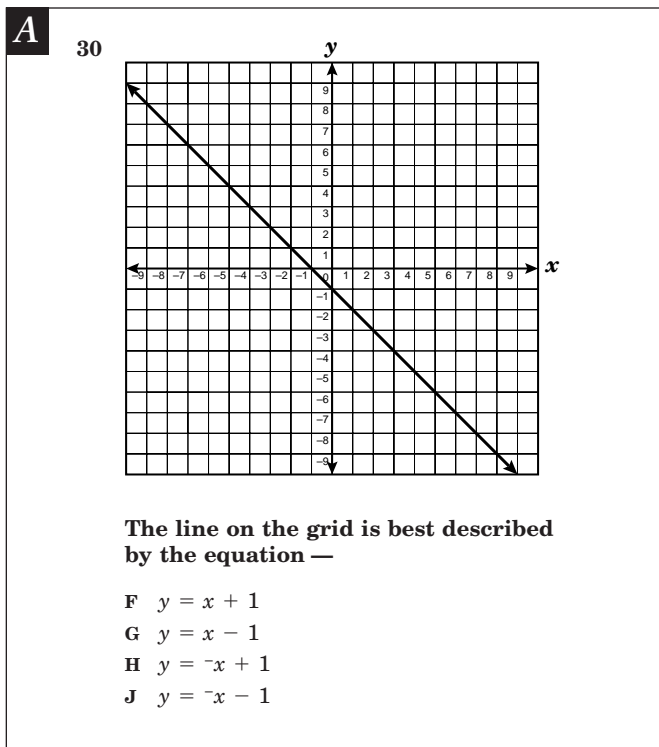
Instruction: Provide students an opportunity to identify a property of real numbers used in simplifying expressions and solving equations and inequalities.

Algebra I

End of Course

A. Standard of Learning: A.6 The student will select, justify, and apply an appropriate technique to graph a linear function in two variables. Techniques will include slope-intercept, x- and y-intercepts, graphing by transformation, and the use of the graphing calculator.

Builds On: Work with graphing coordinates begins in the mathematics SOL in fifth grade and progresses through grades 6 and 7 to graphing lines in grade 8.



Instruction: Provide students with an opportunity to determine the graph of a line when given the x- and y- intercept.

Algebra I

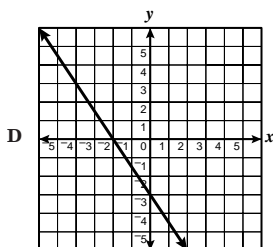
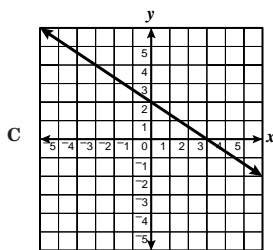
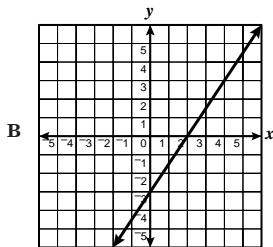
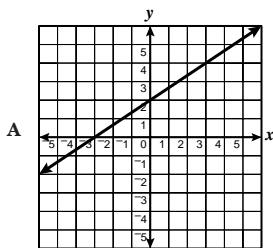
End of Course

A. Standard of Learning: A.7 The student will determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined. The graphing calculator will be used to investigate the effect of changes in the slope on the graph of the line.

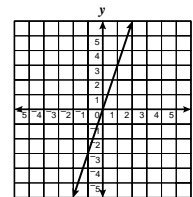
Builds On: Work with graphing coordinates begins in the mathematics SOL in fifth grade and progresses through grades 6 and 7 to graphing lines in grade 8.

A

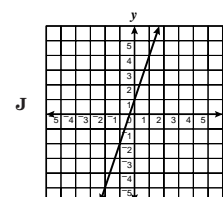
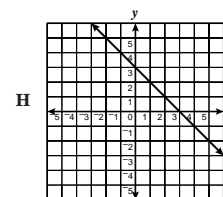
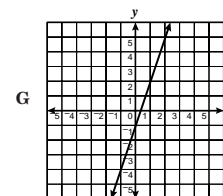
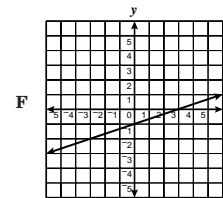
- 31 Which line has y -intercept -3 and x -intercept 2 ?



- 32 The graph below represents the equation $y = 3x$.



Which graph best represents $y = 3x - 1$?



Instruction: Provide students an opportunity to identify the graph of a line when given its x - and y - intercepts; and to identify the graph of an equation when its defining expression has been modified.

Algebra I

End of Course

A. Standard of Learning: A.7 The student will determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined. The graphing calculator will be used to investigate the effect of changes in the slope on the graph of the line.

Builds On: Work with graphing coordinates begins in the mathematics SOL in fifth grade and progresses through grades 6 and 7 to graphing lines in grade 8.

A

- 33 What is the slope of the line that contains (4, -1) and (3, 3)?

A -4

B $-\frac{1}{2}$

C $-\frac{1}{4}$

D 2

- 34 What is the slope of the line $3x + y = 5$?

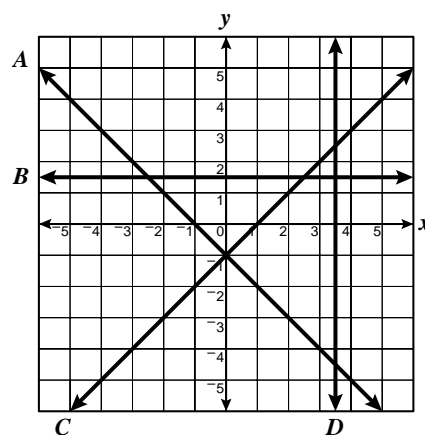
F 3

G -3

H $\frac{1}{3}$

J $-\frac{1}{3}$

35



Which line on the graph has an undefined slope?

A A

B B

C C

D D

Instruction: Provide students an opportunity to determine the slope of a line and to determine if the slope is positive, negative, zero, or undefined when given a graph, two points, or an equation.

Algebra I

End of Course

A. Standard of Learning: A.8 The student will write an equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.

Builds On: Work with graphing coordinates begins in the mathematics SOL in fifth grade and progresses through grades 6 and 7 to graphing lines in grade 8.

A

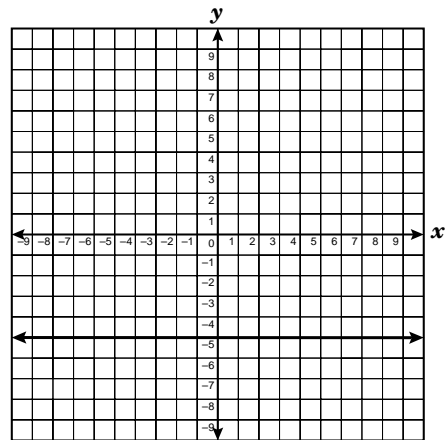
- 36 A line has a slope of -2 and contains the point $(1, -1)$. Which is an equation of this line?

F $y = -2x - 1$
 G $y = -x + 2$
 H $y = -2x + 1$
 J $y = 2x - 3$

- 37 Which is an equation for the line that contains the points $(-2, 3)$ and $(2, -1)$?

A $y = x + 5$
 B $y = x - 3$
 C $y = -x + 1$
 D $y = -2x - 1$

38



Which equation best describes this graph?

F $x = 5y$
 G $x = -5$
 H $y = -5x$
 J $y = -5$

Instruction: Provide students with an opportunity to write an equation of a line given the graph of a line, two points on a line, or the slope and one point on a line.

Algebra I

End of Course

A. Standard of Learning: A.9 The student will solve systems of two linear equations in two variables, both algebraically and graphically, and apply these techniques to solve practical problems. Graphing calculators will be used as both a primary tool of solution and to confirm an algebraic solution.

Builds On: Work with equations begins in the mathematics SOL for grade 2 when students complete numerical sentences involving basic facts for addition and subtraction, and it becomes more formal in the sixth, seventh, and eighth grade SOL.

A

- 39 During a sale, an automobile dealer sold 69 cars and trucks. If she sold 27 more cars than trucks, how many of each did she sell?

A 48 cars, 21 trucks
B 45 cars, 24 trucks
C 42 cars, 27 trucks
D 35 cars, 34 trucks

40

$$\begin{cases} 2x + y = 4 \\ 3x - y = -14 \end{cases}$$

Which is the solution to the system of equations shown?

F (-2, 8)
G (-2, 0)
H (2, 0)
J (0, -2)

Instruction: Provide students an opportunity to write and solve a system of linear equations in two variables, either algebraically or graphically, and use these techniques to solve practical problems.

B. Standard of Learning: A.14 The student will solve quadratic equations in one variable both algebraically and graphically. Graphing calculators will be used both as a primary tool in solving problems and to verify algebraic solutions.

Builds On: Work with equations begins in the mathematics SOL for grade 2 when students complete numerical sentences involving basic facts for addition and subtraction, and it becomes more formal in the sixth, seventh, and eighth grade SOL. Work with developing number sense and understanding of mathematical facts necessary to be successful with factoring occurs throughout the K-8 mathematics SOL.

B

- 41 The velocity of an object in a liquid can be described by the equation $v = 20 - t - t^2$ where v is the velocity in meters per second and t is time in seconds. At what time will $v = 0$?

A 4 sec
B 5 sec
C 6 sec
D 7 sec

- 42 A weather balloon in the shape of a sphere has a surface area of 160 square meters. If the formula for the surface area of a sphere is $S.A. = 4\pi r^2$, to the nearest tenth of a meter, what is the radius of the balloon?

F 2.0 m
G 3.6 m
H 11.2 m
J 12.7 m

Instruction: Provide students with an opportunity to solve quadratic equations both algebraically and graphically and solve problems using the appropriate technique.

Algebra I

End of Course

Reporting Category: Statistics

A. Standard of Learning: A.4 The student will use matrices to organize and manipulate data, including matrix addition, subtraction, and scalar multiplication. Data will arise from business, industrial, and consumer situations.

Builds On: Work with matrices begins with the mathematics SOL in eighth grade.

A

43 Which of the following operations

would result in the matrix $\begin{bmatrix} -4 & 2 \\ 6 & 1 \end{bmatrix}$?

A $2 \begin{bmatrix} -2 & 1 \\ 3 & 0 \end{bmatrix}$

B $\frac{1}{2} \begin{bmatrix} -2 & 1 \\ 3 & 0 \end{bmatrix}$

C $\begin{bmatrix} 5 & 5 \\ 4 & 3 \end{bmatrix} - \begin{bmatrix} -1 & -3 \\ -2 & -2 \end{bmatrix}$

D $\begin{bmatrix} 3 & -1 \\ -2 & 2 \end{bmatrix} + \begin{bmatrix} -7 & 3 \\ 8 & -1 \end{bmatrix}$

44 $[Q] = \begin{bmatrix} 2 & 1 \\ -1 & 1 \\ 3 & 4 \end{bmatrix}$ $[R] = \begin{bmatrix} -7 & 3 \\ -4 & 1 \\ 3 & -2 \end{bmatrix}$

$[Q] - [R] = ?$

F $\begin{bmatrix} -2 & 9 \\ 0 & 3 \\ 6 & 9 \end{bmatrix}$

G $\begin{bmatrix} 9 & -2 \\ 3 & 0 \\ 0 & 6 \end{bmatrix}$

H $\begin{bmatrix} -5 & 2 \\ -5 & 0 \\ -9 & -6 \end{bmatrix}$

J $\begin{bmatrix} 7 \\ 3 \\ -11 \end{bmatrix}$

Instruction: Provide students with an opportunity to add matrices and use scalar multiplication with a given matrix.

Algebra I

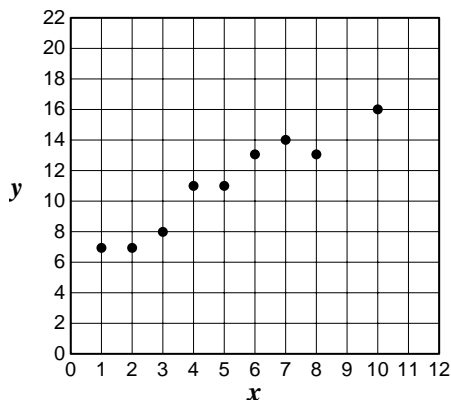
End of Course

A. Standard of Learning: A.17 The student will, given a set of data points, write an equation for a line of best fit, using the median fit method, and use the equation to make predictions.

Builds On: Work with analyzing data and making inferences and work with median begins in the mathematics SOL in sixth, seventh, and eighth grades.

A

45

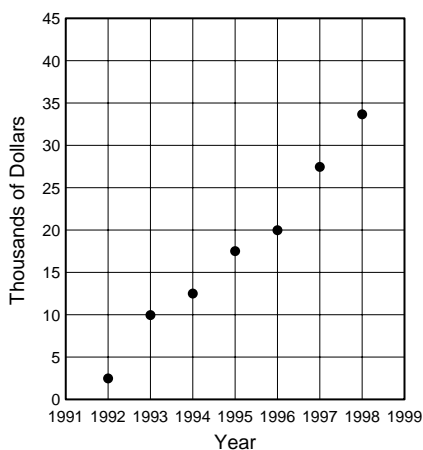


Based on the scatterplot, which x value would best match $y = 17$?

- A 8
- B 11
- C 14
- D 17

46

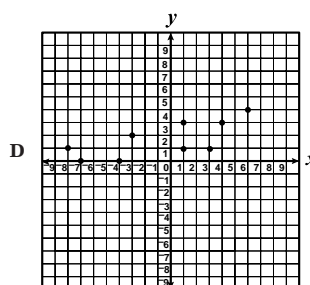
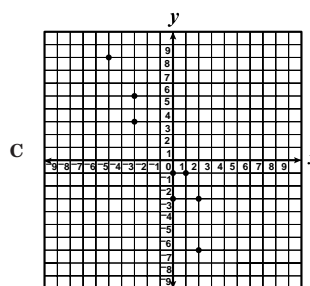
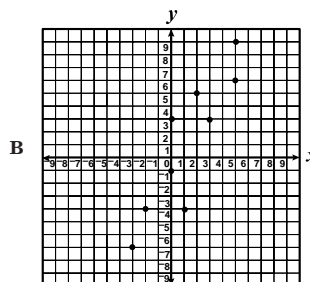
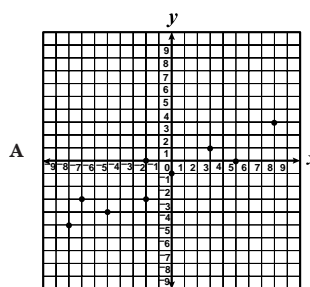
Annual Income



Using the data plotted on the scatterplot, which is the *best* prediction for income in the year 2000?

- F 35,000
- G 43,000
- H 50,000
- J 57,000

47 Using the median fit method, which scatterplot most likely has a line of best fit represented by $y = 2x - 1$?



Instruction: Provide students an opportunity to write an equation for the median fit line from a scatterplot; and to identify a scatterplot when given the equation for the median fit line.

Algebra I

End of Course

A. Standard of Learning: A.18 The student will compare multiple one-variable data sets, using statistical techniques that include measures of central tendency, range, stem-and-leaf plots, and box-and-whisker graphs.

Builds On: Work with stem-and-leaf plots begins in the fifth grade mathematics SOL, and with box-and-whisker graphs in sixth grade. Work with the measures of central tendency begins in fifth grade, progressing in difficulty through the sixth, seventh, and eighth grades.

A

- 48 During a summer reading program, Mary read 9 books. The books contained 217 pages, 138 pages, 159 pages, 356 pages, 270 pages, 112 pages, 138 pages, 210 pages, and 195 pages. What was the median number of pages of the 9 books that Mary read during the summer reading program?

F 138
G 159
H 195
J 244

- 49 In which data set is the median value equal to the mean value?

A {2, 4, 6, 7, 8}
B {12, 18, 20, 23, 24}
C {16, 17, 18, 19, 20}
D {50, 60, 65, 75, 85}

- 50 Jorge made the following stem-and-leaf diagram of the weights of the members of the football team he was coaching.

Stem	Leaf
10	9
11	
12	3, 8
13	2, 4, 4, 6, 8
14	1, 3, 5, 5, 9
15	2, 3, 7, 7, 9
16	1, 3, 7, 8, 8, 8, 9
17	3, 8

What was the mode of the weight of the players on the team?

F 145
G 150
H 152
J 168

Instruction: Provide students an opportunity to compare measures of central tendency using numerical data; and to work with data displayed in a stem-and-leaf plot.

Correct Answers

*End
of
Course*

ALGEBRA I TEST

1. D 2. H 3. D 4. H 5. C 6. H 7. B 8. G 9. C 10. H
11. B 12. H 13. A 14. G 15. C 16. H 17. D 18. G 19. C
20. G 21. C 22. F 23. B 24. H 25. A 26. J 27. C 28. G
29. C 30. J 31. B 32. G 33. A 34. G 35. D 36. H 37. C
38. J 39. A 40. F 41. A 42. G 43. D 44. G 45. B
46. G 47. B 48. H 49. C 50. J